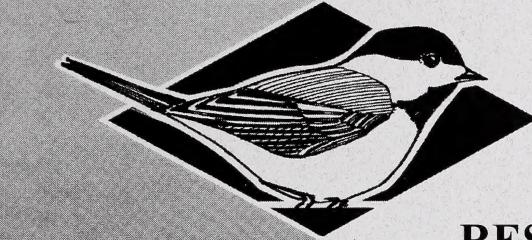


AL.1.1781-2



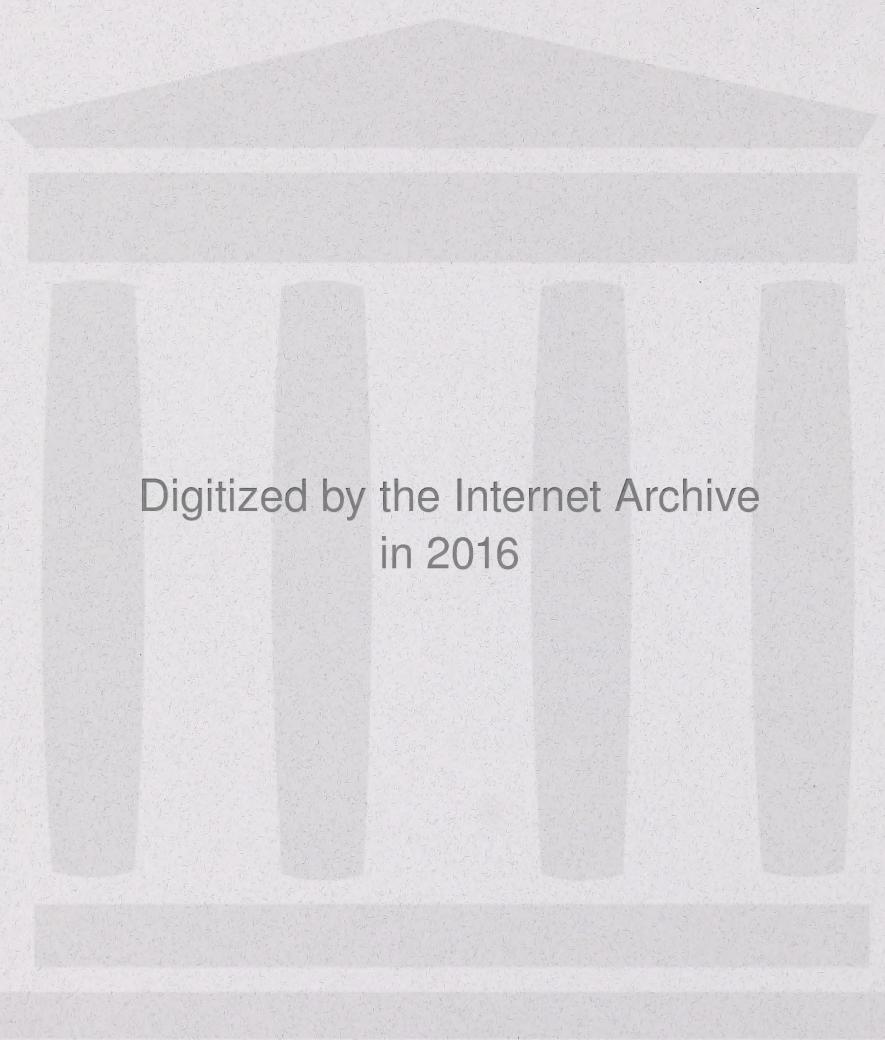
**Fish & Wildlife
Division**

BIODIVERSITY AND
SPECIES AT RISK SECTION

RESEARCHING AMPHIBIAN NUMBERS IN ALBERTA (RANA): 2002 PROVINCIAL SUMMARY



Alberta Species at Risk Report No. 74



Digitized by the Internet Archive
in 2016

https://archive.org/details/researchingamphi00wil_3

RESEARCHING AMPHIBIAN NUMBERS IN ALBERTA (RANA): 2002 PROVINCIAL SUMMARY

Lisa Wilkinson and Stephen Hanus

Alberta Species at Risk Report No. 74

Project Partners:



Alberta
Conservation
Association



YELLOWSTONE TO YUKON
CONSERVATION INITIATIVE

Weldwood

Publication No.: I/115
ISBN: 0-7785-2904-5 (Printed Edition)
ISBN: 0-7785-2905-3 (On-line Edition)
ISSN: 1496-7219 (Printed Edition)
ISSN: 1496-7146 (On-line Edition)

Illustration: Brian Huffman

For copies of this report, contact:

Information Centre – Publications
Alberta Environment / Alberta Sustainable Resource Development
Main Floor, Great West Life Building
9920 108 Street
Edmonton, Alberta, Canada T5K 2M4
Telephone (780) 422-2079

OR

Information Service
Alberta Environment / Alberta Sustainable Resource Development
#100, 3115 12 Street NE
Calgary, Alberta, Canada T2E 7J2
Telephone (403) 297-3362

OR

Visit our website at:
<http://www3.gov.ab.ca/srd/fw/riskspecies/>

This publication may be cited as:

Wilkinson, L. and S. Hanus. 2003. Researching Amphibian Numbers in Alberta (RANA): 2002 provincial summary. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 74. Edmonton, AB.

DISCLAIMER

The views and opinions expressed are those of the authors and do not necessarily represent the policies or positions of the Department or the Alberta Government.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	vi
EXECUTIVE SUMMARY	vii
1.0 INTRODUCTION.....	1
2.0 STUDY AREA.....	2
3.0 METHODS	3
3.1 Pitfall Trapping	3
3.2 Pond Surveys	4
3.3 Reports and Data Storage.....	4
4.0 RESULTS	5
4.1 Pitfall Trapping	5
4.1.1 Spring Pitfall Trapping Session	5
4.1.2 Mid-Summer Pitfall Trapping Session	6
4.1.3 Late Summer Pitfall Trapping Session	6
4.3 Pond Surveys	8
4.3 Education	8
5.0 DISCUSSION.....	9
6.0 MANAGEMENT IMPLICATIONS	10
7.0 LITERATURE CITED	11
8.0 APPENDICES.....	12
Appendix 1. Overall summary of amphibian captures and morphological characteristics from Alberta RANA sites in 2002.....	13
Appendix 2. Summary of historic amphibian captures at each RANA site.....	14

LIST OF FIGURES

Figure 1. Alberta distribution of RANA sites in Alberta.....	2
Figure 2. Layout of fencing and pitfall traps (A), and close-up of pitfall trap design (B).....	3

LIST OF TABLES

Table 1. Spring amphibian captures and morphological characteristics from Alberta RANA sites in 2002	5
Table 2. Mid-summer amphibian captures and morphological characteristics from the Meanook and Saskatoon Island RANA sites in 2002	6
Table 3. Late summer amphibian captures and morphological characteristics from Alberta RANA sites in 2002	7
Table 4. Amphibian species observations from all Alberta RANA sites in 2002.....	8

ACKNOWLEDGEMENTS

The following agencies generously provided funding and/or support for this program:

Alberta Conservation Association
Alberta Sustainable Resource Development
Cypress Hills Provincial Park
Foothills Model Forest
Friends of Saskatoon Island Provincial Park
Human Resources Development Canada (Student Career Placements)
Lesser Slave Lake Provincial Park
Saskatoon Island Provincial Park
University of Alberta, Biological Sciences Division
University of Calgary, Kananaskis Research Station
Weldwood of Canada Ltd., Hinton Division
Yellowstone to Yukon, Conservation Grant

The following people monitored the RANA sites and conducted educational programs, their commitment and hard work are greatly appreciated:

Hinton – Stephen Hanus
Kananaskis – Selwyn Rose
Lesser Slave Lake Provincial Park – Cedar Chittenden
Meanook Biological Field Station – Bobbi-Jo Starr, Kate Murie
Saskatoon Island Provincial Park – Andrea Pollock

Additional support was provided by Patsy Drummond, who surveyed ponds in Cypress Hills Provincial Park, and Karen Graham who provided expertise and assisted with field data collection at the Hinton RANA site. Lisa Takats Priestley provided considerable support regarding all aspects of RANA coordination, and Kris Kendell provided technical and administrative support. A big thanks goes out to the numerous volunteers who provided much needed assistance in the field.

RANA has succeeded over the years through financial and in-kind support from a number of agencies, as well as the continued support of dedicated individuals. This program is a testament to the possibilities and kind of success that can occur when supportive individuals and agencies believe in a common goal.

EXECUTIVE SUMMARY

Five RANA (Researching Amphibian Numbers in Alberta) sites were operated in 2002: Kananaskis (Bow Valley), Hinton (Athabasca Valley), Lesser Slave Lake Provincial Park, Saskatoon Island Provincial Park, and Meanook Biological Research Station.

The types and numbers of amphibian species captured and observed in 2002 were, for the most part, similar to previous years. Four species were captured: boreal chorus frogs, boreal toads, long-toed salamanders, and wood frogs. Shoreline pond surveys were conducted at 185 ponds within four RANA study areas. Species observed, in order of decreasing abundance, were: wood frogs (the most ubiquitous), long-toed salamanders, boreal toads, boreal chorus frogs, Columbia spotted frogs, and northern leopard frogs. No Canadian toads were observed, despite having several study sites within their range. Regional and provincial summaries of amphibian morphological characteristics are provided in this report, along with summaries of capture rates for all species encountered at each of the RANA trapping ponds. Educational programs reached approximately 6700 people.

1.0 INTRODUCTION

Field data collection for the Researching Amphibian Numbers in Alberta (RANA) program was initiated in 1997 in response to the global decline of amphibians. RANA has two primary objectives: 1) collect long-term data on amphibian species populations in Alberta, and 2) provide public education on the importance of amphibians and wetland conservation. Two sites were operated in 1997, and since that time, an additional five monitoring sites were established, although not all sites can be operated every year.

There were five active sites in 2002: Lesser Slave Lake Provincial Park (est. 1997), Saskatoon Island Provincial Park (est. 1999), Meanook Research Station (est. 1997), Athabasca Valley (Hinton; est. 2000), and Bow Valley (Kananaskis; est. 1998). Two sites were not operated in 2002 due to logistical constraints: Cypress Hills Provincial Park and Beaverhill Lake. However, a park interpreter was able to conduct a limited number of pond surveys in Cypress Hills.

The following species have been captured or observed in the RANA program: wood frogs (*Rana sylvatica*), boreal chorus frogs (*Pseudacris maculata*), Columbia spotted frogs (*Rana luteiventris*), northern leopard frogs (*Rana pipiens*), boreal toads (*Bufo boreas*), Canadian toads (*Bufo hemiophrys*), long-toed salamanders (*Ambystoma macractylum*), and tiger salamanders (*Ambystoma tigrinum*). The only two amphibian species that have not been observed during the RANA program are the great plains toad (*Bufo cognatus*) and the plains spadefoot toad (*Spea bombifrons*), both of which are found in the grassland natural region (Alberta Environmental Protection 1994), which is not currently represented. Only one Canadian toad has been captured since the establishment of the RANA program, which occurred in 1998 at Lesser Slave Lake.

Few of Alberta's amphibians are considered 'secure'. Of the species encountered in the RANA program, the northern leopard frog is 'threatened', the Canadian toad 'may be at risk', and the long-toed salamander and spotted frog are 'sensitive' (Alberta Sustainable Resource Development 2000). Long-toed salamanders are the focal species in Hinton and Kananaskis due to the current provincial objective to monitor their population distribution, size, and trends over at least five years. Additional details of the salamander program are in Wilkinson and Hanus (2003a).

Public education has always been a fundamental component of the RANA program. Education for school groups and park visitors take the form of presentations, public event displays, guided hikes, and other activities. Technical presentations are given to land-use managers (industry and government), and at biological conferences. In conjunction with RANA educational programs, the Alberta Amphibian Monitoring Program (AAMP) is promoted. This program encourages members of the public to record and submit amphibian observations throughout the province. An instruction manual, including identification photos and a tape of frog and toad calls, are also provided to interested individuals.

This document is a compilation of 2002 field results from each RANA site. Individual field summary reports for 2002 have been developed for Hinton (Hanus 2003), Kananaskis (Rose 2002), Lesser Slave Lake Provincial Park (Chittenden 2002), Saskatoon Island Provincial Park (Pollock 2002), and Meanook Biological Research Station (Wilkinson and Hanus 2003).

2.0 STUDY AREA

The RANA program selected sites distributed across Alberta (Figure 1) to represent a variety of natural regions (Alberta Environmental Protection 1994). Seven sites have been established, two of which were not operated in 2002 (Cypress Hills and Beaverhill Lake). Cypress Hills is located in a unique montane ecosystem within the grassland natural region, Kananaskis (Bow Valley) is located in the rocky mountain and foothills natural regions, Beaverhill Lake is located in the parkland natural region, the Hinton (Athabasca Valley) site is located in the foothills natural region, and the Meanook Biological Research Station, Lesser Slave Lake and Saskatoon Island Provincial Park sites are all located in the boreal forest natural region. In addition, pond surveys were conducted in and around Banff and Jasper National Parks, and in the Grande Cache area, as part of the long-toed salamander monitoring program, details are in Wilkinson and Hanus (2003a).

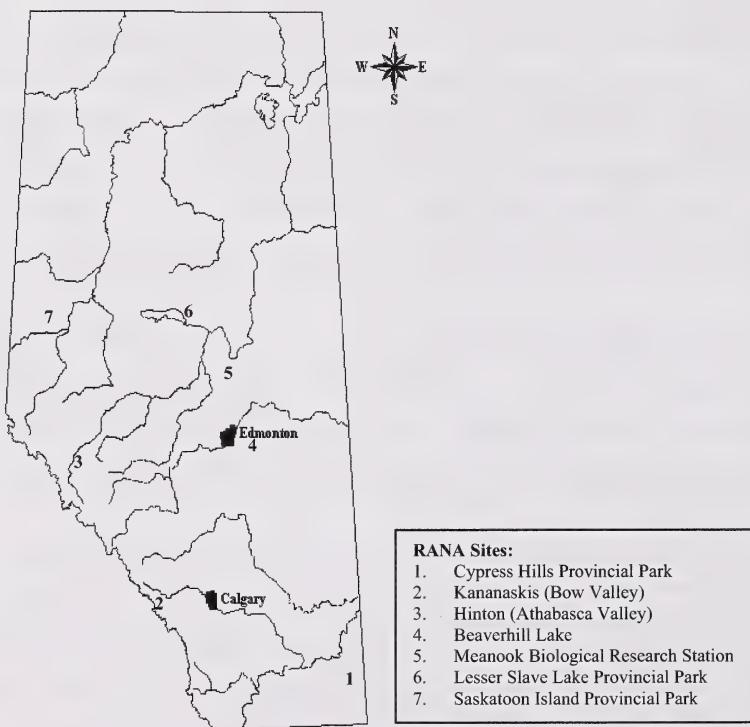


Figure 1. Alberta distribution of RANA sites in Alberta.

3.0 METHODS

Methods for surveying and capturing long-toed salamanders and other amphibians followed Pretzlaw *et al.* (2002), and are summarized below. Any variations to the methods are included in the individual site reports.

3.1 Pitfall Trapping

In each RANA survey area, there is one pond set up for pitfall trapping. The pond is completely or partially encircled with drift net fencing (Figure 2A). Pitfall traps are placed at 10 m intervals on either side of the fence. Theoretically, amphibians travelling to or from the pond to breed will be intercepted by the fence and travel along the barrier until they fall into a trap. Traps consist of two 6 inch plastic flower pots taped together, creating a 12 inch deep trap (Figure 2B). Traps are covered by a square of coroplast, a sturdy and water resistant plastic, held above the traps by 6 inch nails. Trap covers ensure that amphibians are protected from excessive exposure to sun, which can lead to desiccation, and prevent flooding from rainfall. The following items are placed in each trap: a sponge, which is refreshed regularly to retain moisture; a rock that serves as a perch or hiding place; and a stick protruding past the top of the trap to allow small mammals to escape.

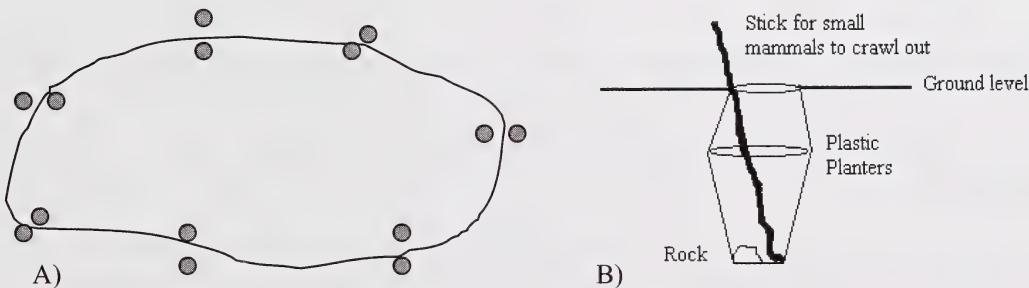


Figure 2. Layout of fencing and pitfall traps (A), and close-up of pitfall trap design (B).

Trapping schedules varied slightly between sites, but traps were generally set during the spring breeding season (May to early June), and late summer (August to early September) when young-of-the-year disperse from the ponds. The Meanook site was operated from July to mid-August for logistic reasons. Throughout the trapping sessions, traps were checked daily or every other day. Traps were generally closed during mid summer when amphibian movement to and from ponds declines. Captured animals were identified, sexed (during breeding), measured, weighed, and released on the opposite side of the fence from which they were captured. Other morphological characteristics, such as presence of dorsal stripes and malformations were also recorded. Generally, long-toed salamanders and wood frogs less than 2.0 g were classified as a young-of-the-year, those over 2.0 g were classified as adults or juveniles (other morphological characteristics were taken into consideration when classifying age). Small individuals captured at the beginning of the season were presumed to be juveniles: young-of-the-year from the previous season. Age and sex differentiation was not possible for all species. Researchers used latex gloves when handling amphibians to avoid contaminating amphibians with oils or hand lotion. Animals being released away from the pond were moistened and placed in a sheltered location; extra care was taken on hot days, releasing

amphibians early or late in the day to prevent desiccation. Environmental data were also collected, including air and water temperature, pond pH, water depth, and other ambient conditions.

At the end of each trapping session, traps were closed by pushing the coroplast cover flush to the ground, and were covered with dirt and a large rock to ensure animals could not enter. The conditions at Saskatoon Island made inverting pitfall traps the best closure method. Also, sections of fence were opened at several locations around the pond to allow animals to pass through.

3.2 Pond Surveys

Pond surveys were conducted to identify presence of breeding amphibians through observations of eggs, larvae/tadpoles, young-of-the-year, or adults, as well as to hear vocalizations in the spring. Survey efforts were most intensive during spring egg-laying in May and June, although some ponds were visited later in the summer to look for presence of larvae and tadpoles.

Surveys were conducted by walking along the perimeter of a pond, or using transects for large and/or partially inaccessible waterbodies, and looking for signs of amphibian presence. Surveys could not be conducted under excessively windy or rainy conditions because the surface of the water was disturbed. Similarly, care was taken not to disturb the surface of the water around the shoreline. Data recorded included number of salamander eggs, number of frog egg masses, and number of toad egg strings. For observations of larvae and tadpoles a specific count was made if possible, otherwise qualitative observations were made using estimates of few, moderate, or abundant (a similar system applies to vocalizations). Observations of adults were also recorded. Environmental data were collected as per pitfall trapping ponds, and GPS locations were recorded for all ponds surveyed.

At some sites, the length of survey distance was recorded, allowing for future calculations of number of eggs/meter, enabling relative abundance comparisons between years and between sites regardless of survey distances.

3.3 Reports and Data Storage

In addition to this summary report, a report was produced for each RANA site and widely distributed to local government offices, stakeholders, funding agencies, participants and volunteers, and other interested parties. All data have been electronically recorded and archived, and have been incorporated into the provincial government Biodiversity/Species Observation Database (BSOD).

4.0 RESULTS

4.1 Pitfall Trapping

Results from spring, mid summer, and late summer pitfall trapping sessions are provided below. An overall summary from the entire 2002 field season for each RANA site is also provided in Appendix 1. In addition, amphibian capture data from each RANA site since their establishment is provided in Appendix 2.

4.1.1 Spring Pitfall Trapping Session

Four of the five active RANA sites were open during the spring trapping session in 2002, and a total of five amphibian species were captured (Table 1). Boreal chorus frogs were the most commonly caught amphibian species among the RANA sites, but nearly all of these captures were at Lesser Slave Lake. Wood frogs were the second most common species captured, and were present at all RANA sites, followed by long-toed salamanders, which were observed only at the Hinton and Kananaskis sites. Boreal toads were captured at all RANA sites during the spring trapping session with one exception (Saskatoon Island), but were the least abundant species.

Table 1. Spring amphibian captures and morphological characteristics from Alberta RANA sites in 2002.

RANA SITE	Species*	Age**	Total #	# Per Trap Night	Sex			Snout-to-Vent Length (cm)		Mass (g)	
					Male	Female	Unk.	Mean	Range	Mean	Range
Hinton May 13-June 29 (767 trap nights)	BOTO	Adult	28	0.038	8	8	12	7.2	5.3-8.9	41.0	12.0-75.0
	LTSA	Adult	114	0.149	41	73	0	6.5	5.0-8.1	5.4	2.6-9.5
	WOFR	Adult	56	0.073	32	16	8	4.4	3.7-5.3	9.4	4.0-15.0
		Juvenile	1	0.001	0	0	1	2.4	N/A	1.5	N/A
	Overall		57	0.074	32	16	9	4.4	2.4-5.3	9.2	1.5-15.0
Kananaskis May 21-June 15 (416 trap nights)	BOTO	Adult	6	0.014	1	0	5	6.0	4.8-6.9	26.3	11.8-36.5
	LTSA	Adult	93	0.224	51	41	1	6.4	5.3-7.8	5.1	3.0-9.0
	WOFR	Adult	5	0.012	0	0	5	4.3	3.8-5.2	9.2	6.5-14.9
Lesser Slave Lake May 12 – June 2 (880 trap nights)	BCFR	Overall	282	0.320	0	0	282	2.4	1.2-3.1	1.4	0.3-2.5
	BOTO	Overall	20	0.023	0	0	20	6.2	2.5-7.3	29.8	1.5-55.0
	WOFR	Adult	112	0.127	104	7	1	4.4	2.5-5.4	10.1	2.0-21.0
		Juvenile	7	0.008	4	0	3	2.3	2.0-2.5	1.4	1.0-1.8
	Overall		119	0.135	108	7	4	4.3	2.0-5.4	9.6	1.0-21.0
Saskatoon Island May 10– June 26 (540 trap nights)	BCFR	Overall	2	0.004	1	1	0	2.4	2.2-2.5	0.8	0.5-1.0
	WOFR	Adult	69	0.127	7	62	0	4.6	2.9-6.0	10.8	3.5-26.0
Totals (2603 trap nights)	BCFR	Overall	284	N/A	1	1	282	2.4	1.2-3.1	1.4	0.3-2.5
	BOTO	Overall	54	N/A	9	8	37	6.7	2.5-8.9	35.1	1.5-75.0
	LTSA	Adult	207	N/A	92	114	1	6.5	5.0-8.1	5.2	2.6-9.5
	WOFR	Adult	242	N/A	143	85	14	4.5	2.5-6.0	10.1	2.0-26.0
		Juvenile	8	N/A	4	0	4	2.3	2.0-2.5	1.4	1.0-1.8
	Overall		250	N/A	147	85	18	4.4	2.0-6.0	9.8	1.0-26.0

*BCFR (Boreal Chorus Frog), BOTO (Boreal Toad), LTSA (Long-Toed Salamander), WOFR (Wood Frog).

**Adult LTSA and WOFR were 2.0g or more, whereas Juvenile LTSA and WOFR were <2.0g.

4.1.2 Mid-Summer Pitfall Trapping Session

Mid-summer pitfall trapping was conducted at Meanook and Saskatoon Island. Wood frogs were the most abundant species at both sites, and were the only species captured at Saskatoon Island (Table 2). Three amphibian species were captured at the Meanook RANA site (boreal chorus frogs, boreal toads, and wood frogs; Table 2).

Table 2. Mid-summer amphibian captures and morphological characteristics from the Meanook and Saskatoon Island RANA sites in 2002.

RANA SITE	Species*	Age**	Total #	# Per Trap Night	Sex			Snout-to-Vent Length (cm)		Mass (g)	
					Male	Female	Unk.	Mean	Range	Mean	Range
Meanook July 7 – Aug. 6 (714 trap nights)	BCFR	Overall	1	0.001	0	0	1	3.1	N/A	2.5	N/A
	BOTO	Overall	12	0.017	0	0	12	3.3	2.7-5.7	4.0	2.5-14.0
	WOFR	Adult	43	0.060	0	0	43	3.1	1.2-5.0	4.4	2.0-14.0
		YOY	22	0.031	0	0	22	1.9	1.2-3.0	1.1	0.5-1.5
		Overall	65	0.091	0	0	65	2.7	1.0-5.0	3.2	0.5-14.0
Saskatoon Island July 11 – July 31 (60 trap nights)	WOFR	Adult	32	0.533	0	32	0	4.3	3.6-5.4	9.2	6.0-19.0
Totals (774 trap nights)	BCFR	Overall	1	N/A	0	0	1	3.1	N/A	2.5	N/A
	BOTO	Overall	12	N/A	0	0	12	3.3	2.7-5.7	4.0	2.5-14.0
	WOFR	Adult	75	N/A	0	32	43	3.6	1.2-5.4	6.5	2.0-19.0
		YOY	22	N/A	0	0	22	1.9	1.2-3.0	1.1	0.5-1.5
		Overall	97	N/A	0	32	65	7.2	1.0-6.0	5.2	0.5-19.0

*BCFR (Boreal Chorus Frog), BOTO (Boreal Toad), LTSA (Long-Toed Salamander), WOFR (Wood Frog).

**Adult LTSA and WOFR were 2.0g or more, whereas YOY (young-of-the-year) LTSA and WOFR were <2.0g.

4.1.3 Late Summer Pitfall Trapping Session

Four of the five active RANA sites were open during the late summer trapping session, and a total of five amphibian species were captured (Table 3). Of the species observed, long-toed salamanders were the most numerous, primarily due to the large number of young-of-the-year captured at the Kananaskis site. Other amphibian species captured, in decreasing order of abundance, were wood frogs, boreal toads, boreal chorus frogs, and Columbia spotted frogs. The majority of amphibians captured were young-of-the-year (Table 3).

Table 3. Late summer amphibian captures and morphological characteristics from Alberta RANA sites in 2002.

RANA SITE	Species*	Age**	Total #	# Per Trap Night	Sex			Snout-to-Vent Length (cm)		Mass (g)		
					Male	Female	Unk.	Mean	Range	Mean	Range	
Hinton Aug. 9 – Oct. 2 (879 trap nights)	BOTO	Overall	1	0.001	0	1	0	8.5	N/A	83.0	N/A	
	LTSA	Adult	16	0.018	6	6	4	5.6	3.4-7.7	4.2	2.0-10.4	
		YOY	88	0.100	1	0	87	3.5	2.8-4.9	1.1	0.5-1.8	
		Overall	104	0.118	7	6	91	3.8	2.8-7.7	1.6	0.5-10.4	
	WOFR	Adult	56	0.063	19	7	30	4.4	3.0-5.5	9.7	4.8-16.4	
		YOY	62	0.071	0	0	62	2.3	2.1-2.9	1.3	1.0-1.6	
		Overall	118	0.134	19	7	92	3.3	2.1-5.5	5.3	1.0-16.4	
Kananaskis Aug 17-Oct. 15 (944 trap nights)	BOTO	Overall	33	0.035	0	0	33	5.7	3.0-8.0	21.7	1.2-38.0	
	CSFR	Overall	3	0.003	0	0	3	7.8	7.4-8.0	>58.3	55->60	
		Adult	26	0.028	1	0	24	4.7	3.5-6.5	3.1	2.0-6.5	
		YOY	347	0.368	0	2	345	2.8	1.8-4.8	0.6	0.1-1.8	
	WOFR	Overall	372	0.394	1	2	369	2.9	1.8-6.5	0.8	0.1-6.5	
		Adult	8	0.008	0	0	8	4.6	4.1-5.3	11.5	8.0-16.5	
		YOY	200	0.212	0	0	200	No Data	N/A	No Data	N/A	
Lesser Slave Lake Aug. 3 – Aug. 21 (800 trap nights)	BCFR	Overall	17	0.021	0	0	17	2.5	1.5-3.2	1.6	0.5-3.5	
		BOTO	Overall	136	0.170	0	0	136	2.9	1.5-7.2	4.4	1.0-40.0
		WOFR	Adult	56	0.070	31	2	23	3.5	2.2-5.6	7.5	2.0-24.0
		YOY	21	0.026	0	0	21	2.1	1.8-2.5	1.3	1.0-1.5	
		Overall	77	0.096	31	2	44	3.1	1.8-5.6	5.8	1.0-24.0	
Saskatoon Island Aug. 1 – Aug. 19 (380 trap nights)	BCFR	Overall	2	0.005	0	2	0	2.5	2.5	1.0	1.0	
		WOFR	Adult	61	0.161	3	58	0	3.9	2.4-7.0	7.2	2.0-20.0
		YOY	3	0.008	0	3	0	2.5	2.5	1.3	1.0-1.5	
		Overall	64	0.168	3	61	0	3.8	2.5-7.0	7.0	1.0-20.0	
Totals (3003 trap nights)	BCFR	Overall	19	N/A	0	2	17	2.5	1.5-3.2	1.5	0.5-3.5	
		BOTO	Overall	170	N/A	0	1	169	3.5	1.5-8.5	8.2	1.0-83.0
		CSFR	Overall	3	N/A	0	0	3	7.8	7.4-8.0	>58.3	55.0->60.0
	LTSA	Adult	41	N/A	7	6	28	5.0	3.4-7.7	3.5	2.0-10.4	
		YOY	435	N/A	1	2	432	3.0	1.8-4.9	0.7	0.1-1.8	
		Overall	476	N/A	8	8	460	3.1	1.8-7.7	0.9	0.1-1.8	
	WOFR	Adult	181	N/A	53	67	61	4.0	2.2-7.0	8.3	2.0-24.0	
		YOY	286	N/A	0	3	283	2.3	1.8-2.9	1.3	0.5-1.6	
		Overall	467	N/A	53	70	344	3.4	1.8-7.0	5.9	0.5-24.0	

*BCFR (Boreal Chorus Frog), BOTO (Boreal Toad), CSFR (Columbia Spotted Frog), LTSA (Long-Toed Salamander), WOFR (Wood Frog).

**Adult LTSA and WOFR were 2.0g or more, whereas YOY (young-of-the-year) LTSA and WOFR were <2.0g.

4.3 Pond Surveys

Pond surveys in 2002 were conducted at 185 ponds in Cypress Hills, Hinton, Kananaskis, Lesser Slave Lake, and Saskatoon Island (Table 4). Additional surveys, which were considered extensions of RANA areas, were conducted in an attempt to locate long-toed salamander breeding sites. In the Kananaskis RANA area, additional surveys were conducted in and east of Banff National Park, and in the Hinton RANA area, additional surveys were conducted in Jasper National Park, south of the McLeod River, and in the Grand Cache area. Wood frogs were the most ubiquitous species, being observed at 55% of all ponds surveyed. The highest amphibian species diversity was at the Kananaskis site, where five species were observed. In Cypress Hills, northern leopard frogs were present at four of six ponds surveyed, with breeding evidence at each site.

Table 4. Amphibian species observations from all pond surveys in 2002.

RANA Site	Total # of Ponds Surveyed	Number of ponds in which species* were observed							
		BCFR	BOTO	CATO	CSFR	LTSA	NLFR	TISA	WOFR
Banff National Park	5	0	0	0	0	3	0	0	1
Cypress Hills	6	2	0	0	0	0	4	0	0
East of Banff	11	0	0	0	0	0	0	0	1
Grand Cache	4	0	1	0	0	0	0	0	2
Hinton	37	2	6	0	0	22	0	0	31
Jasper National Park	26	0	3	0	2	16	0	0	6
Kananaskis	66	1	16	0	13	15	0	0	41
Lesser Slave Lake	20	10	5	0	0	0	0	0	16
Meanook	0	0	0	0	0	0	0	0	0
Saskatoon Island	10	3	3	0	0	0	0	0	7
Totals:	185	18	34	0	15	56	4	0	102

*BCFR (Boreal Chorus Frog), BOTO (Boreal Toad), CATO (Canadian Toad), CSFR (Columbia Spotted Frog), LTSA (Long-toed Salamander), NLFR (Northern Leopard Frog), TISA (Tiger Salamander), WOFR (Wood Frog).

4.3 Education

Educational efforts took a variety of forms, including presentations, public displays, guided talks, plays, and children's activities. An estimated total of 6703 people were informed about amphibians, RANA, the AAMP, and wetland conservation throughout the province (Table 4). Details about presentations and activities are included in each RANA site report.

Table 4. Summary of educational/interpretive presentations given to the public from all Alberta RANA sites in 2002.

RANA Site	# of Presentations/Events	Approximate # of People
Hinton	18	765
Kananaskis	6+	3332
Lesser Slave Lake	10+	1079
Meanook	0	0
Saskatoon Island	32	1527
Totals:	66+	6703

5.0 DISCUSSION

The types of amphibian species captured and observed at RANA sites in 2002 were consistent with data from previous years. Wood frogs continue to be the most ubiquitous species, being widely distributed across the province and the most abundant species captured overall during RANA trapping. Long-toed salamanders were only found at the Hinton and Kananaskis sites, where sampling effort was focused on locating and monitoring this species, which likely accounts for their relative abundance in this study. Columbia spotted frogs were encountered in small numbers because they are found only in the Rocky Mountains within Alberta, at higher elevations than other amphibians. Boreal chorus frogs tend to be absent in the Rocky Mountains and uncommon in the foothills; however, they were the most common species encountered at the Lesser Slave Lake RANA site.

Northern leopard frogs were only observed in the Cypress Hills area, which is expected due to their limited range. Given their current status as 'threatened' it is encouraging that evidence of breeding (*i.e.* tadpole and young-of-the-year observations) was observed at four ponds. There were no observations of tiger salamanders, which had previously been detected at low numbers in Cypress Hills and Beaverhill Lake. Throughout the history of the RANA program, only one Canadian toad has been observed, captured in a pitfall trap at Lesser Slave Lake in 1998. Lesser Slave Lake is at the western edge of Canadian toad distribution in Alberta, which is roughly limited to the eastern half of the province. The Beaverhill Lake RANA site is located in Canadian toad range, but did not record any toads in its two years of operation. Similarly, Meanook is in the Canadian toad range and no observations have been made (this site only operates for approximately six to seven weeks in mid-summer). Although sampling effort within Canadian toad range has been minimal, it is concerning that this species has been encountered so rarely during the RANA program.

It is difficult to make inferences about amphibian population trends because the RANA program has been running for a relatively short period, during which time trapping and survey effort have varied as a result of limited resources. Continued monitoring and improved consistency will eventually yield data from which to draw meaningful conclusions regarding amphibian population trends. Currently, RANA data provide information on amphibian species presence and distribution, which also serve as a warning that a species may potentially be in decline due to its absence, or that certain breeding sites may be vulnerable. The data provide valuable information on timing of breeding cycles and how this relates to ambient conditions, as well as checking for possible deformities or disease. In addition, considerable life history information has been gathered. The variability in the numbers of species caught annually is in itself important, because it reinforces the need to conduct long-term monitoring.

Field data collection for the RANA program began in 1997 at Meanook Biological Research Station and Lesser Slave Lake Provincial Park. Although other sites have been added to the program, only five were operational in 2002. The continued operation of at least some of these sites is essential to gather long-term data on provincial amphibian populations. Continued operation of the Hinton and Kananaskis sites is important because they contain some of the few, isolated breeding populations of long-toed salamanders in the province, and have suitable habitat for Columbia spotted frogs. Attempts are underway to reinstate the program at Cypress Hills, the only RANA site with a threatened species. In addition, Cypress Hills represents a unique ecosystem in southern Alberta, providing valuable wildlife habitat. It is also important to recognize the importance of northern monitoring sites.

Clearly, all RANA sites are valuable, and the selection of which sites can be maintained is dependent not only on their location (*i.e.* habitat and amphibian associations), but on the availability of funding and resources. In some cases, provincial parks can share the operation of these sites while emphasizing the educational component. Similarly, grass roots organizations associated with provincial parks and important natural areas are fundamental in providing funds, and in some cases, volunteers. The RANA program has typically employed researchers to operate sites, while relying on volunteers for additional support.

Few amphibian species in Alberta are considered secure and wetland habitat is disappearing. Amphibian populations are known for their stochasticity, being strongly affected by environmental conditions. Long-term monitoring is therefore necessary to detect changes in population trends. Maintenance of at least some RANA sites, including sites in key habitats and with long monitoring histories, is strongly recommended. Aside from amphibian monitoring, the RANA program provides extensive public education about amphibians and wetland conservation, which is arguably as important as monitoring. In recognition of global amphibian declines and national efforts to track amphibian population trends, Alberta's maintenance of the RANA program is critical.

6.0 MANAGEMENT IMPLICATIONS

Management recommendations are limited given the relatively short period of time RANA has been operating. The primary recommendation is preservation of wetlands (*i.e.* prevent draining and contamination), particularly those wetlands known to have breeding populations of species at risk. Introduction of fish can also have a detrimental effect on amphibians, particularly long-toed salamanders. Minimizing potentially destructive activities around ponds is an additional consideration. On crown land, protective notations have been applied to create buffers around some breeding ponds. It is important to maintain communication with landowners and people who participate in activities around critical amphibian ponds in order to foster a sense of stewardship and appreciation for wetland ecosystems. Signage and education programs should be integrated with management activities.

7.0 LITERATURE CITED

Alberta Environmental Protection. 1994. Natural Regions of Alberta: Summary. Alberta Environmental Protection. Edmonton, AB. 18 pp.

Alberta Sustainable Resource Development. 2000. The general status of Alberta wild species, 2000. Alberta Environment/Alberta Sustainable Resource Development. Edmonton, AB. 46 pp. http://www3.gov.ab.ca/srd/fw/status/2000/2000_General_Status_Species_Rpt.pdf

Chittenden, C. 2002. Researching Amphibian Numbers in Alberta: Lesser Slave Lake Provincial Park final report for 2002. Alberta Conservation Association. Edmonton, AB.

Hanus, S. 2003. Researching Amphibian Numbers in Alberta (RANA) Athabasca Valley Region - Hinton, Alberta. 2002 field summary. Alberta Conservation Association, Edmonton, AB.

Pollock, A. 2002. Researching Amphibian Numbers in Alberta (RANA) Saskatoon Island Provincial Park, Alberta. 2002 field summary. Alberta Conservation Association. Edmonton, AB.

Pretzlaw, T., M. Huynh, L. Takats, L. Wilkinson. 2002. Protocol for monitoring long-toed salamander (*Ambystoma macrodactylum*) populations in Alberta. Alberta Species At Risk Report No. 35. Alberta Sustainable Resource Development. Edmonton, AB.

Rose, S. 2002. Researching Amphibian Numbers in Alberta (RANA) Kananaskis Country and surrounding area, Alberta. 2002 field summary. Alberta Conservation Association. Edmonton, AB.

Wilkinson, L. and S. Hanus. 2003a. Long-toed salamander conservation in the Alberta foothills; 2002 field summary. Alberta Species At Risk Report No.73. Alberta Sustainable Resource Development. Edmonton, AB.

Wilkinson, L. and S. Hanus. 2003b. Researching Amphibian Numbers in Alberta (RANA) Meanook Biological Research Station, Alberta. 2002 field summary. Alberta Sustainable Resource Development, Edson, AB.

8.0 APPENDICES

Appendix 1. Overall summary of amphibian captures and morphological characteristics from Alberta RANA sites in 2002.

RANA SITE	Species*	Age**	Total #	# Per Trap Night	Sex			Snout-to-Vent Length (cm)		Mass (g)		
					Male	Female	Unk.	Mean	Range	Mean	Range	
Hinton May 13 – June 29; Aug. 9 – Oct. 2 (1646 trap nights)	BOTO	Overall	29	0.018	8	9	12	7.2	5.3-8.9	42.5	12.0-83.0	
	LTSA	Adult	130	0.079	47	79	4	6.4	3.4-8.1	5.2	2.0-10.4	
		YOY	88	N/A	1	0	87	3.5	2.8-4.9	1.1	0.5-1.8	
		Overall	218	0.132	48	79	91	5.3	2.8-8.1	3.6	0.5-10.4	
	WOFR	Adult	112	0.068	51	23	38	4.4	3.0-5.5	9.5	4.0-16.4	
		YOY	63	N/A	0	0	63	2.3	2.1-2.9	1.3	1.0-1.6	
		Overall	175	0.106	51	23	101	3.7	2.1-5.5	6.6	1.0-16.4	
Kananaskis May 21-June 15; Aug 17-Oct. 15 (1360 trap nights)	BOTO	Overall	39	0.029	1	0	38	5.8	3.0-8.0	22.4	1.2-38.0	
	CSFR	Overall	3	0.002	0	0	3	7.8	7.4-8.0	>58.3	55.0->60.0	
		Adult	118	0.087	52	41	25	6.0	3.7-7.8	4.7	2.0-9.0	
		YOY	347	N/A	0	2	345	2.8	1.8-4.8	0.6	0.1-1.8	
		Overall	465	0.342	52	43	370	3.6	1.8-7.8	1.7	0.1-9.0	
	WOFR	Adult	13	0.010	0	0	13	4.6	3.8-5.3	10.8	6.5-16.5	
		YOY	200	N/A	0	0	200	1.9	1.8-2.2	0.6	0.5-0.8	
		Overall	213	0.157	0	0	213	3.5	1.8-5.3	6.8	0.5-16.5	
Lesser Slave Lake May 12 – June 2; Aug. 3 – Aug. 21 (1680 trap nights)	BCFR	Overall	299	0.178	0	0	299	2.4	1.2-3.2	1.4	0.3-3.5	
	BOTO	Overall	156	0.093	0	0	156	3.3	1.5-7.3	7.7	1.0-55.0	
		Adult	168	0.100	135	9	24	4.1	2.2-5.6	9.2	2.0-24.0	
	WOFR	YOY	28	N/A	4	0	24	2.2	1.8-2.5	1.3	1.0-1.5	
		Overall	196	0.117	139	9	48	3.8	1.8-5.6	8.1	1.0-24.0	
Meanook July 7 – Aug. 6 (714 trap nights)	BCFR	Overall	1	0.001	0	0	1	3.1	N/A	2.5	N/A	
	BOTO	Overall	12	0.017	0	0	12	3.3	2.7-5.7	4.0	2.5-14.0	
		Adult	43	0.060	0	0	43	3.1	1.2-5.0	4.4	2.0-14.0	
	WOFR	YOY	22	N/A	0	0	22	1.9	1.2-3.0	1.1	0.5-1.5	
		Overall	65	0.091	0	0	65	2.7	1.0-5.0	3.2	0.5-14.0	
Saskatoon Island May 10– June 26; July11 – July 31; Aug. 1 – Aug. 19 (980 trap nights)	BCFR	Overall	4	0.004	1	3	0	2.5	2.5	0.9	0.5-1.0	
	WOFR	Adult	162	0.165	10	152	0	4.3	2.4-7.0	9.1	2.0-26.0	
		YOY	3	N/A	0	3	0	2.5	2.5	1.3	1.0-1.5	
		Overall	165	0.168	10	155	0	4.2	2.4-7.0	8.9	1.0-26.0	
	Totals: (6383 trap nights)	BCFR	Overall	304	N/A	1	3	300	2.4	1.2-3.2	1.4	0.3-3.5
		BOTO	Overall	236	N/A	9	9	218	4.2	1.5-8.9	14.1	1.0-83.0
		CSFR	Overall	3	N/A	0	0	3	7.8	7.4-8.0	>58.3	55.0->60.0
		LTSA	Adult	248	N/A	99	120	29	6.2	3.4-8.1	5.0	2.0-10.4
		YOY	435	N/A	1	2	432	3.0	1.8-4.9	0.7	0.1-1.8	
		Overall	683	N/A	100	122	461	4.2	1.8-8.1	2.3	0.1-10.4	
		WOFR	Adult	498	N/A	196	184	118	4.1	1.2-7.0	8.9	2.0-26.0
		YOY	316	N/A	4	3	309	2.3	1.0-3.0	1.2	0.5-1.8	
		Overall	814	N/A	200	187	427	3.8	1.0-7.0	7.3	0.5-26.0	

*BCFR (Boreal Chorus Frog), BOTO (Boreal Toad), CSFR (Columbia Spotted Frog), LTSA (Long-Toed Salamander), WOFR (Wood Frog).

**Adult LTSA and WOFR were 2.0g or more, whereas YOY (young-of-the-year) LTSA and WOFR were <2.0g; Juveniles have been included with YOY.

Appendix 2. Summary of historic amphibian captures at each RANA site.

A. Beaverhill Lake

Year	# Trap Nights	BCFR* Total # caught (# caught per trap night)	TISA* Total # caught (# caught per trap night)	WOFR* Total # caught (# caught per trap night)
1998	2073	17 (0.008)	1 (0.000)	182 (0.089)
1999	1257	1 (0.001)	1 (0.001)	111 (0.088)
2000	186	2 (0.011)	0 (0.000)	14 (0.075)
2001	0	N/A	N/A	N/A
2002	0	N/A	N/A	N/A

*BCFR (Boreal Chorus Frog), TISA (Tiger Salamander), WOFR (Wood Frog).

B. Cypress Hills Provincial Park

Year	# Trap Nights	BCFR* Total # caught (# caught per trap night)	NLFR* Total # caught (# caught per trap night)	TISA* Total # caught (# caught per trap night)
1998	180	2 (0.011)	5 (0.028)	31 (0.172)
1999	927	4 (0.004)	20 (0.022)	12 (0.013)
2000	1440	2 (0.001)	19 (0.013)	15 (0.010)
2001	0	N/A	N/A	N/A
2002	0	N/A	N/A	N/A

*BCFR (Boreal Chorus Frog), NLFR (Northern Leopard Frog), TISA (Tiger Salamander).

C. Hinton and Area

Year	# Trap Nights	BOTO* Total # caught (# caught per trap night)	LTSA* Total # caught (# caught per trap night)	WOFR* Total # caught (# caught per trap night)
2000	743	44 (0.058)	135 (0.180)	346 (0.468)
2001	1072	13 (0.012)	161 (0.150)	69 (0.064)
2002	1646	29 (0.018)	218 (0.132)	175 (0.106)

*BOTO (Boreal Toad), LTSA (Long-Toed Salamander), WOFR (Wood Frog).

D. Kananaskis and Area

Year	# Trap Nights	BOTO* Total # caught (# caught per trap night)	CSFR* Total # caught (# caught per trap night)	LTSA* Total # caught (# caught per trap night)	WOFR* Total # caught (# caught per trap night)
1998	1068	33 (0.031)	7 (0.007)	186 (0.174)	61 (0.057)
1999	383	11 (0.029)	2 (0.005)	10 (0.026)	12 (0.031)
2000	522	3 (0.006)	0 (0.000)	6 (0.011)	3 (0.006)
2001	484	11 (0.023)	1 (0.002)	34 (0.070)	8 (0.017)
2002**	1363	39 (0.029)	3 (0.002)	465 (0.341)	213 (0.156)

* BOTO (Boreal Toad), CSFR (Columbia Spotted Frog), LTSA (Long-Toed Salamander), WOFR (Wood Frog).

**In 2002 a new RANA trapping site was established, Kuhn's Pond. The previous site was not operated because the pond dried up by mid-summer for three consecutive years.

Appendix 2 (Cont.). Summary of historic amphibian captures at each RANA site.

E. Lesser Slave Lake Provincial Park

Year	# Trap Nights	BCFR* Total # caught (# caught per trap night)	BOTO* Total # caught (# caught per trap night)	WOFR* Total # caught (# caught per trap night)
1997	724**	8 (0.011)	7 (0.010)	73 (0.101)
1998***	3456	5 (0.001)	23 (0.007)	33 (0.001)
1999	3312	57 (0.017)	114 (0.034)	119 (0.036)
2000	3216	26 (0.008)	84 (0.026)	52 (0.016)
2001	840	29 (0.035)	817 (0.973)	83 (0.099)
2002	1680	299 (0.178)	156 (0.093)	196 (0.117)

*BCFR (Boreal Chorus Frog), BOTO (Boreal Toad), WOFR (Wood Frog).

**The number of trap nights is an estimate given difficulties interpreting the number of trap malfunctions in the original data.

***One Canadian toad was captured in 1998.

F. Meanook Biological Research Station

Year	# Trap Nights	BCFR* Total # caught (# caught per trap night)	BOTO* Total # caught (# caught per trap night)	WOFR* Total # caught (# caught per trap night)
1997	518	4 (0.008)	3 (0.006)	193 (0.387)
1998	755	4 (0.005)	343 (0.454)	277 (0.367)
1999	630	2 (0.003)	7 (0.011)	23 (0.037)
2000	2090	6 (0.003)	125 (0.06)	36 (0.017)
2001	644	4 (0.006)	8 (0.012)	316 (0.49)
2002	714	1 (0.001)	12 (0.017)	65 (0.091)

*BCFR (Boreal Chorus Frog), BOTO (Boreal Toad), WOFR (Wood Frog).

G. Saskatoon Island Provincial Park

Year	# Trap Nights	BCFR* Total # caught (# caught per trap night)	BOTO* Total # caught (# caught per trap night)	WOFR* Total # caught (# caught per trap night)
1999	1070	9 (0.008)	0 (0.000)	128 (0.120)
2000	1081	17 (0.016)	2 (0.002)	44 (0.041)
2001	996	5 (0.005)	3 (0.003)	74 (0.074)
2002	980	4 (0.004)	0 (0.000)	165 (0.168)

*BCFR (Boreal Chorus Frog), BOTO (Boreal Toad), WOFR (Wood Frog).

List of Titles in This Series
(as of June 2003)

- No. 1 Alberta species at risk program and projects 2000-2001, by Alberta Sustainable Resource Development, Fish and Wildlife Division. (2001)
- No. 2 Survey of the peregrine falcon (*Falco peregrinus anatum*) in Alberta, by R. Corrigan. (2001)
- No. 3 Distribution and relative abundance of the shortjaw cisco (*Coregonus zenithicus*) in Alberta, by M. Steinhilber and L. Rhude. (2001)
- No. 4 Survey of the bats of central and northwestern Alberta, by M.J. Vonhof and D. Hobson. (2001)
- No. 5 2000 survey of the Trumpeter Swan (*Cygnus buccinator*) in Alberta, by M.L. James and A. James. (2001)
- No. 6 2000/2001 Brassy Minnow inventory at Musreau Lake and outlet, by T. Ripley. (2001)
- No. 7 Colonial nesting waterbird survey in the Northwest Boreal Region – 2000, by M. Hanneman and M. Heckbert. (2001)
- No. 8 Burrowing owl trend block survey and monitoring - Brooks and Hanna areas, by D. Scobie and R. Russell. (2000)
- No. 9 Survey of the Lake Sturgeon (*Acipenser fulvescens*) fishery on the South Saskatchewan River, Alberta (June-September, 2000), by L.A. Winkel. (2000)
- No. 10 An evaluation of grizzly bear-human conflict in the Northwest Boreal Region of Alberta (1991-2000) and potential mitigation, by T. Augustyn. (2001)
- No. 11 Harlequin duck monitoring in the Northern East Slopes of Alberta: 1998-2000 preliminary results, by J. Kneteman and A. Hubbs. (2000)
- No. 12 Distribution of selected small mammals in Alberta, by L. Engley and M. Norton. (2001)
- No. 13 Northern leopard frog reintroduction. Raven River - Year 2 (2000), by K. Kendell. (2001)
- No. 14 Cumulative effects of watershed disturbances on fish communities in the Kakwa and Simonette watersheds. The Northern Watershed Project. Study 3 Progress report, by T. Thera and A. Wildeman. (2001)
- No. 15 Harlequin duck research in Kananaskis Country in 2000, by C.M. Smith. (2001)
- No. 16 Proposed monitoring plan for harlequin ducks in the Bow Region of Alberta, by C.M. Smith. (2001)
- No. 17 Distribution and relative abundance of small mammals of the western plains of Alberta as determined from great horned owl pellets, by D. Schowalter. (2001)
- No. 18 Western blue flag (*Iris missouriensis*) in Alberta: a census of naturally occurring populations for 2000, by R. Ernst. (2000)
- No. 19 Assessing chick survival of sage grouse in Canada, by C.L. Aldridge. (2000)
- No. 20 Harlequin duck surveys of the Oldman River Basin in 2000, by D. Paton. (2000)
- No. 21 Proposed protocols for inventories of rare plants of the Grassland Natural Region, by C. Wallis. (2001)
- No. 22 Utilization of airphoto interpretation to locate prairie rattlesnake (*Crotalus viridis viridis*) hibernacula in the South Saskatchewan River valley, by J. Nicholson and S. Rose. (2001)

No. 23 2000/2001 Progress report on caribou research in west central Alberta, by T. Szkorupa. (2001)

No. 24 Census of swift fox (*Vulpes velox*) in Canada and Northern Montana: 2000-2001, by A. Moehrenschlager and C. Moehrenschlager. (2001)

No. 25 Population estimate and habitat associations of the long-billed curlew in Alberta, by E.J. Saunders. (2001)

No. 26 Aerial reconnaissance for piping plover habitat in east-central Alberta, May 2001, by D.R.C. Prescott. (2001)

No. 27 The 2001 international piping plover census in Alberta, by D.R.C. Prescott. (2001)

No. 28 Prairie rattlesnake (*Crotalus viridis viridis*) monitoring in Alberta – preliminary investigations (2000), by S.L. Rose. (2001)

No. 29 A survey of short-horned lizard (*Phrynosoma hernandesi hernandesi*) populations in Alberta, by J. James. (2001)

No. 30 Red-sided garter snake (*Thamnophis sirtalis parietalis*) education and relocation project – final report, by L. Takats. (2002)

No. 31 Alberta furbearer harvest data analysis, by K.G. Poole and G. Mowat. (2001)

No. 32 Measuring wolverine distribution and abundance in Alberta, by G. Mowat. (2001)

No. 33 Woodland caribou (*Rangifer tarandus caribou*) habitat classification in northeastern Alberta using remote sensing, by G.A. Sanchez-Azofeifa and R. Bechtel. (2001)

No. 34 Peregrine falcon surveys and monitoring in the Parkland Region of Alberta, 2001, by R. Corrigan. (2002)

No. 35 Protocol for monitoring long-toed salamander (*Ambystoma macrodactylum*) populations in Alberta, by T. Pretzlaw, M. Huynh, L. Takats and L. Wilkinson. (2002)

No. 36 Long-toed salamander (*Ambystoma macrodactylum*) monitoring study in Alberta: summary report 1998-2001, by M. Huynh, L. Takats and L. Wilkinson. (2002)

No. 37 Mountain plover habitat and population surveys in Alberta, 2001, by C. Wershler and C. Wallis. (2002)

No. 38 A census and recommendations for management for western blue flag (*Iris missouriensis*) in Alberta, by R. Ernst. (2002)

No. 39 Columbian mountain amphibian surveys, 2001, by D. Paton. (2002)

No. 40 Management and recovery strategies for the Lethbridge population of the prairie rattlesnake, by R. Ernst. (2002)

No. 41 Western (*Aechmophorus occidentalis*) and eared (*Podiceps nigricollis*) grebes of central Alberta: inventory, survey techniques and management concerns, by S. Hanus, H. Wollis and L. Wilkinson. (2002)

No. 42 Northern leopard frog reintroduction – year 3 (2001), by K. Kendell. (2002)

No. 43 Survey protocol for the northern leopard frog, by K. Kendell. (2002)

No. 44 Alberta inventory for the northern leopard frog (2000-2001), by K. Kendell. (2002)

No. 45 Fish species at risk in the Milk and St. Mary drainages, by RL&L Environmental Services Ltd. (2002)

No. 46 Survey of the loggerhead shrike in the southern aspen parkland region, 2000-2001, by H. Kiliaan and D.R.C. Prescott. (2002)

No. 47 Survey of native grassland butterflies in the Peace parkland region of northwestern Alberta – 2001, by M. Hervieux. (2002)

No. 48 Caribou range recovery in Alberta: 2001/02 pilot year, by T. Szkorupa. (2002)

No. 49 Peace parkland native grassland stewardship program 2001/02, by A. Baker. (2002)

No. 50 Carnivores and corridors in the Crowsnest Pass, by C. Chetkiewicz. (2002)

No. 51 2001 Burrowing owl trend block survey and monitoring, Brooks and Hanna areas, by D. Scobie. (2002)

No. 52 An evaluation of the ferruginous hawk population in Alberta based on recent trend data, by D.P. Stepnisky, G.L. Erickson, J. Iwaasa and B. Taylor. (2002)

No. 53 Alberta amphibian call surveys. A pilot year. Final report, by L. Takats and C. Priestley. (2002)

No. 54 Utilization of a roadside survey technique to survey burrowing owl (*Athene cunicularia hypugaea*) in southeastern Alberta, by J. Nicholson and C. Skiftun. (2002)

No. 55 Alberta species at risk program and projects 2001-2002, by Alberta Sustainable Resource Development, Fish and Wildlife Division. (2002)

No. 56 Developing a habitat-based population viability model for greater sage-grouse in southeastern Alberta, by C.L. Aldridge. (2001)

No. 57 Peregrine falcon surveys and monitoring in the Northeast Boreal Region of Alberta, 2001, by R. Corrigan. (2002)

No. 58 2002 burrowing owl trend block survey and monitoring, Brooks area, by R.F. Russell. (2002)

No. 59 Rare plant inventory of the eastern edge of the lower foothills natural subregion, west-central Alberta, by J. Doubt. (2002)

No. 60 Western (*Aechmophorus occidentalis*) and eared (*Podiceps nigricollis*) grebes of central Alberta: 2002 field summary, by S. Hanus, L. Wilkinson and H. Wollis. (2002)

No. 61 Inventory of western spiderwort (*Tradescantia occidentalis*) in Alberta: 2002, by S. Peters. (2003)

No. 62 Bullsnakes (*Pituophis catenifer sayi*) in Alberta: literature review and data compilation, by K.J. Kissner and J. Nicholson. (2003)

No. 63 Distribution of Ord's kangaroo rats in southeastern Alberta, by D.L. Gummer and S.E. Robertson. (2003)

No. 64 Lethbridge prairie rattlesnake conservation project: 2002/2003 progress report, by R.D. Ernst. (2003)

No. 65 Short-horned lizard (*Phrynosoma hernandesi hernandesi*) populations in Alberta – 2002 survey results, by J.D. James. (2003)

No. 66 Inventory and monitoring protocol for naturally occurring western blue flag (*Iris missouriensis*) in Alberta, by R.D. Ernst. (2003)

No. 67 The use of call playbacks for censusing loggerhead shrikes in southern Alberta, by D.R.C. Prescott. (2003)

No. 68 Survey of bats in northeastern Alberta, by A. Hubbs and T. Schowalter. (2003)

No. 69 Survey protocol for the Richardson's ground squirrel, by B.A. Downey. (2003)

No. 70 Population estimates and a survey protocol for ferruginous hawks in Alberta, by B.N. Taylor. (2003)

No. 71 Testing methods for detecting wolverine, by G. Mowat, C. Kyle and D. Paetkau. (2003)

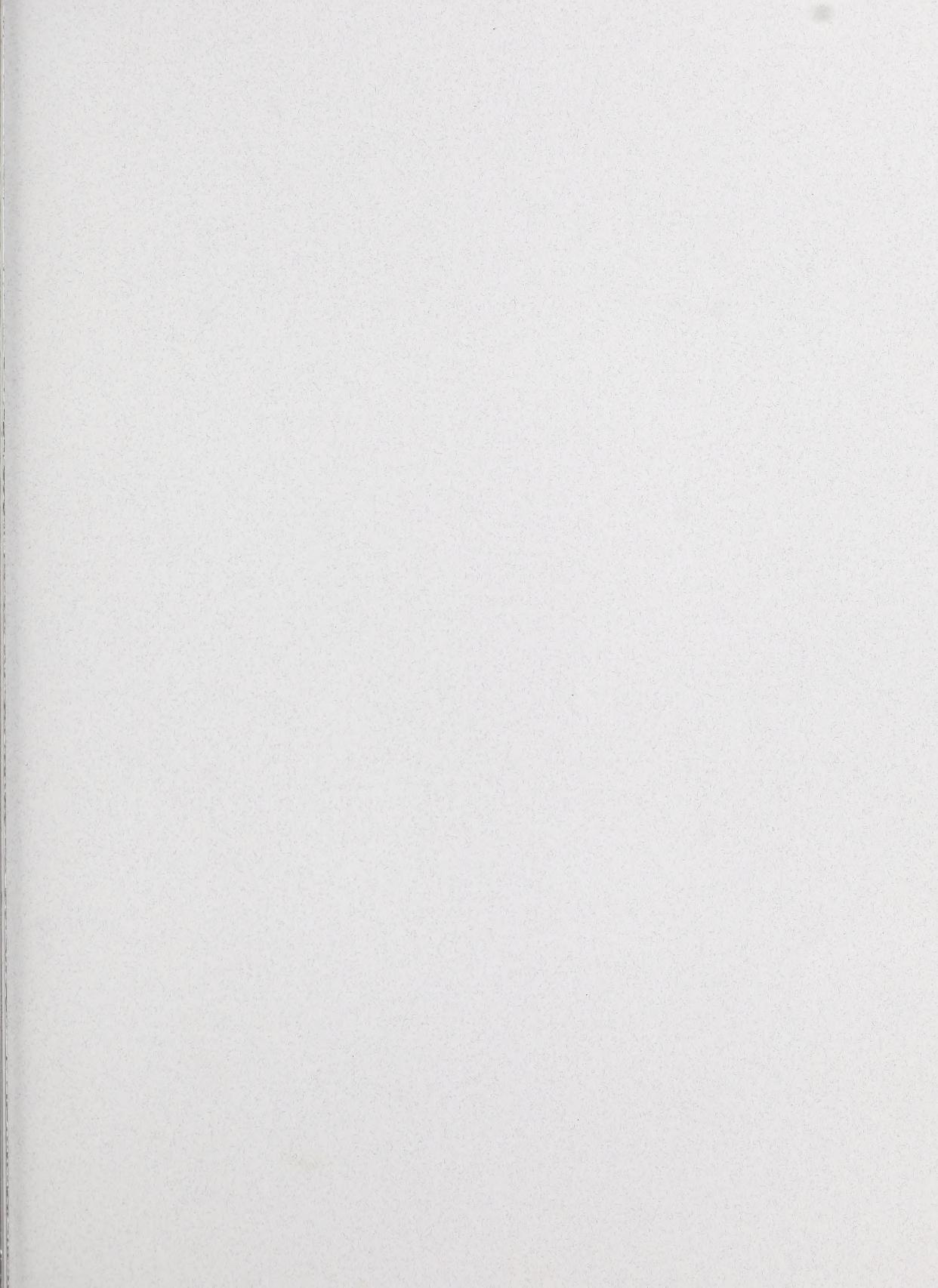
No. 72 A multi-species conservation strategy for species at risk in the Milk River basin: year 1 progress report, by R.W. Quinlan, B.A. Downey, B.N. Taylor, P.F. Jones and T.B. Clayton. (2003)

No. 73 Long-toed salamander (*Ambystoma macrodactylum*) conservation in the Alberta foothills: 2002 field summary report, by L. Wilkinson and S. Hanus. (2003)

No. 74 Researching Amphibian Numbers in Alberta (RANA): 2002 provincial summary, by L. Wilkinson and S. Hanus. (2003)

No. 75 Distribution and habitat associations of the long-toed salamander (*Ambystoma macrodactylum*) in the Oldman River drainage, by K. Pearson. (2003)

No. 76 Prairie rattlesnake (*Crotalus viridis*) hibernacula: monitoring history in Alberta 1987-2002, by K.J. Kissner and J. Nicholson. (2003)



NATIONAL LIBRARY OF CANADA
Bibliothèque nationale du Canada



3 3286 53028548 1